NEW SERIES, No. 6. JUNE, 1889.

PUBLICATIONS OF THE

AMERICAN

STATISTICAL ASSOCIATION.

I. AMERICAN RAILROAD STATISTICS. By Prof. Arthur T. Hadley.

II. STATISTICS OF MUNICIPAL FINANCE. By Prof. Henry B. Gardner.

III–XI. Miscellany: Newsholme's Vital Statistics; Manual of American Water-Works; Chronicle Fire Tables; Two Commercial Geographies; English Labour Statistics; Works of Journal of Royal Statistical Society; Tabulation of Statistics; Report of Seventh Convention of Commissioners of Bureaus of Labor Statistics; Books Received by the Library.

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CONSTITUTION

OF THE

AMERICAN STATISTICAL ASSOCIATION.

ARTICLE I. This Association shall be denominated the AMERICAN STATISTICAL ASSOCIATION.

ART. II. The objects of the Association shall be to collect, preserve, and diffuse statistical information in the different departments of human knowledge.

ART. III. The Association shall be composed of Fellows and Honorary Members.

ART. IV. All members shall be chosen by ballot; nomination for membership shall first be submitted to the Board of Directors; if approved by them, the names shall be presented to the Association, and for election the affirmative votes of four fifths of the members present shall be necessary. Each Fellow shall pay annually two dollars, or twenty dollars at some one time.

ART. V. Fellows only shall be entitled to vote, but Honorary Members shall have the right to sit and deliberate in all the meetings of the Association.

ART. VI. The officers of the Association shall be a President, five Vice-Presidents, a Recording Secretary, a Corresponding Secretary, a Treasurer, a Librarian, and three Counselors, who, together with the President and Secretaries, shall form a Board of Directors for the government of the institution, three of whom shall constitute a quorum at any meeting regularly convened. There shall be also three Standing Committees of three members each, namely, on Publication, on Finance, and on the Library.

ART. VII. The Association shall meet in the city of Boston, on the third Friday in January, April, and October, and at such other times as the Board of Directors shall appoint. At the annual meeting in January, the Association shall hear reports of the Board of Directors, of the Treasurer, of the Librarian, and of the Standing Committees, elect officers, and transact other business. Vacancies may be filled at any regular meeting. Five members shall be necessary to form a quorum for transacting business and the election of members, but a less number may adjourn the meeting.

ART. VIII. No alteration in this Constitution shall be made except on notice at a previous meeting, and by a vote of three fourths of the members present.

AMERICAN STATISTICAL LIBRARY.

The American Statistical Association possesses a Statistical Library, the result of forty years' collection, which is designed as a depository for statistical works of every nature. At present the Library is placed in rooms 31–33, Rogers Building, Massachusetts Institute of Technology, Boston. Its collection embraces not only the publications of the United States, but also many valuable reports issued by Statistical Bureaus of foreign countries. It also includes the very valuable statistical library collected by the former President, Dr. Jarvis, and bequeathed to the Association upon his death, in 1884. It is believed that the collection and preservation of reports which admit of a classification according to statistical groupings, will be of great public service, and the Association therefore earnestly requests a generous co-operation in still further enlarging the library in such directions.

Reports of vital and social statistics, registration reports, census documents, municipal reports, documents relating to public works, reports of trade, commerce, taxation, finance, insurance, industry, labor, health, crime, education, and religion are especially desired. Due acknowledgment of all donations will be given, and, when practicable, an exchange with the Publications of the Association will be made. It is especially desired that members of the Association will contribute copies of their writings.

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NEW SERIES, No. 6. JUNE, 1889.

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CONTENTS.

I. American Railroad Statistics. *By Prof. Arthur T. Hadley.* 241

II. Statistics of Municipal Finance. *By Prof. Henry B. Gardner.* 254

III. Newsholme's Vital Statistics. *By Dr. John S. Billings.* 269

IV. Manual of American Water-Works. *By Prof. George F. Swain.* 271

V. Chronicle Fire Tables. 273

VI. Two Commercial Geographies. 275

VII. English Labour Statistics. 277

VIII. Index of Journal of Royal Statistical Society. 278

IX. Tabulation of Statistics. (Abstract of Article by H. Hollerith, in School of Mines Quarterly.) . . 279

X. Report of Seventh Convention of Commissioners of Bureaus of Labor Statistics. (Furnished by Hon. Horace G. Wadlin.) 282

XI. Books Received by the Library. 292

Health Reports.
Registration Reports.
Education,— College Catalogues.
Agricultural Reports.
Railroad Reports.

AMERICAN

STATISTICAL ASSOCIATION.

NEW SERIES, No. 6. JUNE, 1889.

Read before the AMERICAN STATISTICAL ASSOCIATION, April 25, 1889.

AMERICAN RAILROAD STATISTICS.

BY PROF. ARTHUR T. HADLEY.

HISTORY.

1. The oldest, and for many years almost the only, source of statistical information consists of the reports of the railroads themselves.

From the very first such reports were annually made by the directors to the stockholders. If properly arranged they furnish a large part of the statistical information which interests the general public. They should contain an account of the permanent expenditures on the property, and the means by which they are met, whether stock, bond, floating debt, or surplus earnings. This forms the General Balance Sheet. To this should be appended a description of some of the physical characteristics of the road,—length of line, bridges, buildings, and equipment. In addition to this, and distinct from it, is the income account for the year, giving a classified summary of receipts and expenditures, to which is appended an account of the work done, the miles run by trains of various descriptions, the amount of freight and passenger transportation. The stockholders must have these facts fully presented to them in order to know the

condition of their own property; and any presentation which can properly satisfy the stockholders gives most of the information which the public requires.

Unfortunately, few of the earlier railroad reports were made out in this form. At the outset the directors themselves did not know enough to do so. The complete separation of capital and revenue account was comparatively new. Few manufacturers employed it to anything like the extent in use at present. As a consequence, the balance sheet of a sheet of a railroad was arranged like that of a bank. Income and property balances were jumbled into one mass. The result was hopeless confusion.

Even when they had begun to learn how railroad accounts should be arranged many of the directors continued to follow the old practice. They did not regard it as desirable to present the facts fully and clearly. It does not necessarily follow that they were dishonest. They had an exaggerated idea, in many cases, of the importance of business secrets. They conceived that more harm was done by making business conditions known to the public than by concealing them from the stockholders. This was a wholly wrong view; but it was held by many people who should have known better. If we add to these cases the number of those railroads which were dishonestly managed, and where concealment was sought with fraudulent purposes, we should see how incomplete was the information to be expected from the voluntary action of the directors themselves. A few companies gave good reports, the majority gave bad ones.

Apart from the question of goodness or badness of individual reports, the diversity in minor details rendered them nearly useless for general statistics. One railroad gave its information in one form, another in another; any attempt to summarize the two was out of the question. Twenty-one years ago Mr. Henry V. Poor published the first number of his "Manual," which has since been a standard book of reference. For more than ten years he could do little more

than to publish the reports of the several companies with but slight attempt at any summary. He could give general statistics of mileage, perhaps with some approach to accuracy, and, with less confidence, a few leading items with regard to capital and earnings, which were common to all reports. But any detailed description of work done was wholly impossible.

2. The next important source of information is found in the reports of state officials. New York,[1] by Act of 1849, took the lead in this matter. Beginning with 1850, we have pretty complete transportation reports of New York railroads to the State Engineer. The requirements were good, decidedly ahead of their time; their fulfillment was, of course, imperfect. Efforts were made to extend the powers of the state authorities. A proposal for a commission, made by the State Engineer in the report for 1854, is fifteen years in advance of what was finally accomplished in Massachusetts. But the crisis of 1857, and then the war, turned men's minds in another direction. A few states followed the example of New York, but without important statistical results. In principle this may have marked a slight advance over that state of things where we had to rely on voluntary reports of directors to stockholders. In practice the difference amounted to very little. The State Engineer had neither the time nor the powers to inaugurate any real reform.

The rise of the system of railroad commissions gave an opportunity for more effective work. As early as 1871 the Massachusetts Commission turned its special attention to the subject of accounts. It made haste slowly, consulting with the officials of the different companies. The classification of earnings gave no trouble. The account of work done was brought into such shape that all the companies reported it on a nearly uniform system, without much delay. But the

[1] Massachusetts Act of 1846 required returns, but did not involve their compilation. Partial compilation was begun in 1849.

arrangement and subdivision of expenses was a much more complicated problem, and it was a number of years before anything like uniformity could be obtained in this respect.

The efforts of the Massachusetts Commissioners met a hearty response from other states, not merely from the Commissioners themselves, but from far-sighted railroad men, who saw that the old system of secrecy was an evil, and true publicity a protection to legitimate interests. A preliminary convention to secure uniformity of returns was held in 1877; a more important one at Saratoga in 1879, which agreed upon certain points with regard to the classification of operating expenses. This arrangement, known as the Saratoga classification, has been at the basis of all subsequent railroad statistics; but it was so far indefinite as to leave room for a great deal of divergence in practice, even by those who conformed to its general requirements.

Totally apart from the question of any such divergence, state statistics of railroad operation are not particularly good. State lines form an artificial boundary which railroad systems pass and repass at a number of different points. It is possible to ascertain the mileage within a given state; it is not possible to ascertain with anything like the same accuracy either the receipts or expenses belonging to that state. Any such apportionment must be wholly arbitrary. Sometimes it is not made at all; generally it is made in such a manner as to be useless. Most of the inferences with regard to the volume of traffic which could be obtained from the state reports, as such, would be positively misleading. If we had to choose between a set of state reports thus and a set of reports of different railroad companies arranged on a uniform system, the latter would be far more useful. The separate railroad systems have far more unity and independence than the separate state lines. In the one case the division is organic; in the other it is accidental. The best statistical work done by the state commissions was first in familiarizing the railroad men with the idea of pub-

licity of accounts, and next in laying down a few of the general principles by which such publicity can best be secured. When the Interstate Commission has brought its statistical work into more advanced shape, it is most sincerely to be hoped that the state statistics will be treated as subsidiary. Recent events show a tendency in this direction. A convention of state railroad commissioners, held at Washington last March, decided to conform their respective accounts, in all essential features, to the requirements of the form prescribed by the Interstate Commissioners.

8. The first systematic collection of national railroad statistics is to be found in the fourth volume of the United States Census of 1880. This contains —

I. The income account (not fully itemized) of the railroads of the country for the fiscal year 1880.

II. The general balance-sheet (permanent assets and liabilities) in detail.

III. Financial results of traffic operations,— itemized earnings and expenses.

IV. Physical description of traffic operations,— not quite complete.

V. Analysis of character of freight.

VI. Description of equipment and employees.

VII. Statistics of accidents,— not complete, owing to imperfect record of the companies themselves.

VIII. History of construction.

IX–XII. Physical statistics of track.

Supplementary tables give more detailed analysis of funded debt, land grants, outstanding contracts, etc., but by no means wholly complete exhibits.

On the whole, the transportation work in the Census is wonderfully well done. In spite of the difficulties under which the authorities labored, owing to the newness of the work, the result is fully as good, if not better, than that which has been obtained in the same field in any other country; and is, in certain essential features, better than

what the Interstate Commerce Commission, with eight years' subsequent experience to guide it, is now trying to do.

The appearance of the United States Census, and the familiarity of the officials of the different roads with some of its leading requirements, enabled Henry V. Poor, in 1882, for the first time to publish certain general statistics of work done. These he has continued to give from year to year, in the face of a good deal of difficulty. Within two years past the Interstate Commission has addressed itself to the same work, with facilities, of course, far superior to those of any private individual. Early in 1888 a provisional form was issued for the railroad men to discuss and criticise. After some delay the final or definite form of report was issued in July. The information asked was so detailed that it was impossible to obtain anything like complete statistics during the first year, and the original report of the statistician, Prof. Henry C. Adams, is occupied more with general considerations than with definite or tangible results.

PRINCIPLES INVOLVED.

4. We may divide railroad statistics roughly into those which are chiefly economic and those which are chiefly physical in their character. Under the latter head come statistics with regard to grades and curves, with regard to material used in construction, and with regard to accidents. Under the former head come the accounts of finance and business operations. It is to these that we shall devote chief attention.

A railroad differs from most other lines of business in the sharp separation between permanent and current expenditures. Every good system of railroad statistics takes full account of this, giving a description and financial condition of the property on the one hand as distinct from the operations on the other. The chief items of information under the former head are, first, length of line, length of track, and amount of equipment in various forms with the relation

of these items to the area and population; second, cost of these various items as well as other accessory forms of property incidental to the operation of the road; third, means by which this cost has been met. This part of the subject is well understood. Every one agrees, for the most part, as to the questions which ought to be asked; the only difficulty is in answering them.

The easiest question to ask, and the hardest to answer, is, How are we to estimate the real capital of a road? It is well known that a large part of the stock is water, that is, does not represent any money actually paid in. On the other hand, from time to time, it often happens that repairs have been paid for out of earnings, and are not charged to the general balance sheet at all. It is hard to tell what is the amount of these errors, and how far they balance each other.[2]

Another disputed point relates to the current assets and liabilities of a company. No road can keep its bills wholly paid up or wholly collected. The consequence is that it has some outstanding cash assets and some current liabilities. How far shall the latter be included in the capital account of a road? The Interstate Commissioners have tried to settle the matter by having each road report its current liability balance, which hardly seems a satisfactory solution of the problem.

5. The difficulties in arranging the schedules under the current account of operations are far greater. Let us try to explain a few of the points involved, and then see how the different systems adopted meet the requirements of the case.

Among the current expenditures of a railroad there are always a number of purely financial ones, such as interest and rentals, which do not form part of the operating expenses in the narrower sense. These form, in all systems of railroad

[2] There is a possibility of mistake in attempting to compare mileage with area or population, because it is so easy to confuse the location of the reporting office with the location of the road itself, an error which has actually been made in the first of the statistical reports of the Interstate Commerce Commission.

accounting, a class by themselves, known under the general head of fixed charges.

There are, in the second place, a number of general expenses for salaries for general officers, outside agencies and advertising, legal service, and a variety of other things which attach to the operation of the road, as a whole rather than any particular part of it. These form a second class.

There are expenditures for repairs in all conceivable forms, classified under the head of maintenance, and usually divided into maintenance of way and maintenance of equipment.

Finally, there are the direct and immediate expenses of transportation or of handling the traffic, which may be subdivided into two distinct heads, train service and supplies on the one hand, and station service and supplies on the other.

These distinctions are more important than would appear at first sight. It is characteristic of railroad economy that some of the expenses, like those of train and station service, vary in proportion to the traffic, while others are very far from doing so. An increase in the traffic does not necessarily bring an increase in the amount of general expenses, or even in the amount of maintenance charges, the latter being in many instances due to the weather rather than to wear. It is in the highest degree desirable that this distinction should be recognized in the statistics as far as possible. It is hardly too much to say that the merits of various arrangements of operating expenses depend largely upon the recognition of this distinction. The Saratoga classification made little attempt at arrangement of this kind. It simply divided the items under some twenty different heads, and left the different reports free to group these heads as they might choose. The United States Census went a step farther, and a long step in the right direction. Besides the distinction of fixed charges from operating expenses in the narrower sense, which every one recognizes, it made a farther separation of maintenance of way and maintenance of equip-

ment, but grouped general expenses, train service and station service under the one comprehensive head of "transportation." This was an error, but being an error of omission was not a very serious one. It simply requires the statistician, when he wants to draw conclusions on certain vital points, to add up various separate items for himself instead of having the work done for him in advance.

Some of the State Commissions have adopted substantially the classification of the United States Census. Others have gone farther, and have separated general expenses from transportation expenses, in the narrower sense. On the other hand, a few of the authorities and many of the railroads prefer a radically different division of the accounts, not making maintenance of equipment a separate head, but grouping locomotive repairs with fuel and locomotive wages under the general head of locomotive service, while car repairs were arranged under the head of train service in the same way. This practice has something to be said in its favor, especially from the point of view of railroad economy, but for the purposes of the political student it is not so good as the other; and we may congratulate ourselves that the Interstate Commission did not adopt it, but preferred the New York plan, that is to say, substantially the one outlined at the beginning of this section.

Another thing done by the Interstate Commerce Commission was not nearly so good. In their blank forms they attempt to separate all railroad expenses by an arbitrary apportionment to freight and passenger business.

At first sight this seems natural enough. Every one wants to know what it costs a railroad to transport a passenger or a ton of freight a given distance. The Commissioners so much desired this information that they have lost sight of the fact that it is the nature of things not to be had, and that what they are getting is a false and arbitrary return which is worse than none at all. Their letter of instructions shows in an indirect way the fallacy involved. They say

that in dividing expenses between freight and passenger business, those which are naturally divisible should be classed under the respective heads; those which are "not naturally divisible" should be apportioned in the ratio of the passenger and freight train mileage. This is purely arbitrary. If they are not naturally divisible why should they be artificially divided? How does the Commission know that a freight train mile should be equal to a passenger train mile in the amount of maintenance of buildings which it involves? How do they know that each should share equally in the proportion of the salary of the president chargeable to it? It is one of those cases where an attempt to divide is arbitrary in its resting on a series of unproved assumptions, and giving, in many instances, at any rate, fallacious results. Suppose that a given line of freight could not pay its share of the repairs of fences. Ought the railroad to discard such freight when it will contribute to the profits of the road without causing any additional damage to the property of the line from infuriated cows?

The expenses for train and station service can be apportioned and distributed. The expenses of passenger trains, and of agents at passenger stations, are directly chargeable to passenger service, and an increase in the amount of business done will bring a more or less direct increase in these expenses. The same may be said of the corresponding expenditures with regard to freight. To a considerable extent this is true of car repairs of various sorts. On the other hand, the general expense of maintennce of way and the interest do not increase with the development of new traffic. Suppose it costs fifty cents per train mile to carry a hundred passengers or two hundred tons of freight. The direct expense of carrying such passenger is about half a cent a mile. The direct expense of carrying the freight is about one quarter of a cent per ton mile. Each of these things represents something tangible. Any business obtained at rates higher than this, provided it could be obtained on no

other terms, represents so much gain to the railroad. The fact that it appears to be done at less than the average cost of doing the whole business does not prevent its being good policy. The fact is, that the average cost of doing the whole business, itemized in the way that the Commission desires to see it done, is in the highest degree misleading. This is the most serious fault in the arrangement proposed by the Interstate Commerce Commission, and we cannot help hoping that it will be modified in the course of time.

There is another system of division of expenses into movement and terminal charge. This has not been extensively adopted by the statisticians of this country; but the courts, both here and in England, have often tried to use it. The underlying idea is this: The expenses of handling any kind of traffic are partly independent of the distance and partly proportionate to it. Station expenses belong to the former class; train and track expenses to the latter. The theory is that the tariff for any distance should consist of a fixed terminal, *plus* a mileage rate proportionate to the distance. This sounds plausible; but it involves the same fallacy as the arbitrary distribution of freight and passenger expenses. Many of the things which are charged as terminals do not attach to any particular piece of traffic, but to the business as a whole.

This matter is so important statistically, and so frequently misunderstood, that I shall ask your pardon for reiterating it in another form.

A railroad loads a ton of freight at a cost of a dollar. When this is once in the car it can be carried at a cost of only a quarter of a cent a mile. With the increased distance only the latter element increases proportionately. So much for the distribution of terminal and movement expenditures. Now suppose the railroad gets twice as many tons of freight. Will all expenses double? Obviously not. There is a distinction between expenses which vary with increase of traffic and those which do not, analogous to that between

terminal and movement expenses, but more fundamental and more important. The latter classification is well enough in its way; but in any good system of railroad statistics it must be made subordinate to the former.

6. In order that the figures of dollars and cents may mean anything, we must have an actual description of the work done. The statistical units of operation which are common to all roads and to all good systems of reporting in this country, are: 1. The number of tons or passengers handled; 2. The aggregate amount of transportation,— ton or passenger miles; 3. The aggregate amount of train movement,— freight or passenger train miles.[3]

The second of these in a rough way represents the amount of *public service done*, and is the best thing with which to compare the receipts. Thus we find that the average receipts of the railroads of the United States are 2.28 cents per passenger mile, and 1.06 cents per ton mile, while those of Prussia are 1.34 per passenger mile, and 1.34 cents per ton mile. In this way a measure of transportation service and transportation payment is obtained in something like tangible form.

On the other hand, the first and third are units of *railroad* service, and the expenses should, to a great extent, be compared with them. Thus, if we compare the station service, expenses of freight and passengers, with the number of tons or passengers handled, we obtain a criterion of station economy. If we compare the train expenses with the number of miles run by the trains of the various classes, we obtain the results of train economy on the roads in question. The attempt to compare expenses with ton mileage or passenger mileage is simply a matter of convenience as furnishing the best common measure for train and station service,

[3] The first of these units requires no explanation. The second is a little more complicated. The annual mileage is obtained by multiplying the weight of each consignment by the distance hauled, and adding together all the products. Passenger mileage and train mileage are obtained in a similar manner, except that no allowance is made for differences in weight in computing them.

though inaccurate when applied to either of them separately.

The maintenance and general expenses, as a criterion of general economy, should be compared, not with the operations, but with the track mileage. A mile of track, to be kept in a good standard of usefulness, ought to require a certain amount of track-watchman's services, which will be needed, whether ten trains pass a day, or fifteen. Only in case of extraordinary changes in traffic should these items vary. The account of expenses on a given road is not completely or accurately presented by lumping everything in one sum, but by grouping the general expenses into one head, and the direct or distributed ones into another. We may thus say, with considerable approach to accuracy, that the ordinary expenses on the railroads of the United States is from three thousand to four thousand dollars a mile, *plus* forty to sixty cents a train mile, and the cases outside of these rather narrow limits will be few in number. But if we attempt to say that the average cost of handling a ton of freight is one cent a mile, we are dealing with a set of facts whose variations are so great as to render a generalization wholly useless. Under different amounts of traffic, roads which are otherwise alike may find a variation in cost of 400 per cent. It is obvious that it is in the highest degree desirable so to arrange our statistics as to guard against this danger.

In another year I hope to be able to present figures analyzed according to the principles here set forth. The present time is not a good one for the purpose. The United States census, which furnished an excellent basis in its time, deals with past history. The State Reports are just being superseded; the Interstate figures are still highly incomplete. It would be a waste of time and ink to do today what must be entirely set aside a few months hence.

Read before the AMERICAN STATISTICAL ASSOCIATION, Jan. 25, 1889.

STATISTICS OF MUNICIPAL FINANCE.

BY PROF. HENRY B. GARDNER.

In any attempt to formulate comparative statistics showing the financial condition of our municipalities we are met at the outset by serious obstacles, and any statements based upon the face of the returns in auditors' or controllers' reports are apt to prove misleading. An obvious source of error in our judgment as to the relative financial transactions of various cities exists in the unnoted differences in the administrative jurisdictions. Thus, in Chicago, the territory of the city is divided into townships, which meet some kinds of local expenditure without the intervention of the city. In New Haven the care of the poor, and the maintenance of the roads and bridges, devolves upon the township and not upon the city; while the expense of schools is borne by a third body, — the school district. Doubtless, a careful examination would reveal like variations in many other municipalities. A knowledge of these facts is necessary for purposes of accurate comparison, but the knowledge is not always easily attainable, and a clue is seldom afforded in the financial reports.

Another obstacle lies in the methods of presenting the financial statement. Not only is there a total lack of uniformity, but the methods adopted are frequently so complex and misleading, clearness of presentation is so completely sacrificed to the exigencies of book-keeping, and the chance requirements of administrative organization and financial legislation, that it is difficult to obtain a satisfactory idea of the finances of a given city, aside from any attempt at comparison with other cities. The reports of the various

controllers and auditors vary widely in this respect,[1] but in no case, I believe it is safe to say, is there any clear and concise presentation of the facts necessary to a proper understanding of the financial situation,—a presentation, that is, which shows us what have been the amounts of the ordinary income and expenditure, with the sources of income and the purposes of expenditure clearly classified, and the relation of surplus or deficit existing between the two; the extraordinary income and expenditure, also specified as to source and purpose; what portion of expenditure has been to meet running expenses, and what for construction; how far reliance has been placed upon loans; whether loans have been used to cover current expenses; how far undertakings, such as gas works and water works, have been made to yield a profit, or what was the deficit, in their operation, which it has been necessary to supply.

The difficulties which present themselves in connection with these reports may be classified as follows:—

1. General want of classification, as exhibited in failure to distinguish properly between ordinary and extraordinary receipts and expenditures, and lack of clear statement as to sources of receipts and purposes of expenditure, particularly as to whether expenditure has been to meet running expenses or for new construction. This difficulty is of course increased by the differences in the administrative and financial organizations of the various municipalities. In Boston, for example, the duty of street cleaning belongs to the health department, while in Philadelphia it devolves upon the department of highways, bridges, and sewers, and in New York is the subject of a special department. It is a matter of importance from an economic point of view to know what portion of revenue comes from licenses, but receipts from this source are frequently scattered among the various departments of the administration. In the case of

[1] The Boston report is on the whole the most satisfactory. The presentation is clearest, and the great amount of detail renders possible the correction of error.

Boston receipts from licenses must be sought under "police" and "schools," as well as "liquor licenses." In Baltimore the street railway companies, in 1887, paid a franchise tax of $134,167.27. In the report of the Registrar this entry is divided under the two heads, separated by other items,—"city passenger railway companies for park sinking fund," and "city passenger railway companies for park board." In the Controller's report it is comprised under the headings "park board, for Druid Hill and Patterson Parks," and "the railway companies for park sinking fund." In many cases it is impossible, from the report itself, to remedy this confusion of classification.

2. The inclusion among the ordinary receipts and expenditures of items which do not properly belong there, either because they fall without the sphere of municipal finance altogether, or because they have to do with an essentially different class of transactions from the other items among which they are included. As an example of the first case take the inclusion among municipal receipts and expenditures of the revenue collected for, and paid over to, the state. Thus, in the report of the Auditor of Boston, for 1887–88, the receipts from taxes for 1887 are given as $9,387,028.75; but of this sum $833,805 belonged to the state, and really formed no part of the income of the city, which acted merely as the agent of the state. In New York, out of $31,728,039.81, $4,258,527.93 belonged to the state. In Baltimore the state taxes do not appear in the city accounts, and thus any comparison between these cities, based on a transcript of their financial reports, must be erroneous. The case is frequently the same with license taxes, of which the state demands a portion. There is no more reason for including state taxes among municipal receipts and expenditures than there is for including national taxes under the same head. Municipal receipts and expenditures should be confined to such transactions as have to do with strictly municipal matters.

As an example of the second case I would mention payments to and from the sinking funds. These are sometimes included among the ordinary receipts and expenditures. They represent however, an entirely different class of transactions. They are not really receipts and expenditures at all, in a strict sense.

A sinking fund is simply a reserve fund of the city, to be counted among the assets. A payment to the sinking fund should represent not an expense but a surplus of income over expense. A payment from the sinking fund is not a receipt but a draft on the reserve fund, which will appear in the diminished assets. Another instance of the same kind is that of trust funds, the gifts of outside parties, simply the administration of which is in the hands of the city. The receipts and expenditures on account of such funds should be noted, as they sometimes take the place of municipal receipts and expenditures, but they should be distinguished from the latter.

3. An error which sometimes leads to ludicrous results arises in connection with temporary loans in anticipation of taxes, when the transactions on account of both the borrowing and repayment are included among the other items of receipts and expenditures. Thus, in the Controller's report of the city of New York the receipts on account of the city treasury are stated as $69,600,593.97, of which $17,242,846.70 came from temporary loans in anticipation of taxes. The expenditures were $67,900,425.42, of which $18,295,600 was for payment of such loans, part of which had been incurred in former years. Receipts and expenditures should therefore be reduced by $17,242,846.70, in order to present an accurate idea of the facts, only the balance of the transactions in revenue bonds appearing. In the case of New York the error arising from the inclusion of the two items of state taxes and revenue bonds would amount to between one fourth and one third of the total amount of apparent receipts,

or a sum nearly three times as much as the total receipts of Baltimore.

Errors from the causes already mentioned are, however, evident, and can, to a great extent, be avoided by a rearrangement of the items given in a Controller's report.

4. There is still another class of errors which it is more difficult to trace and correct. These arise from the method of keeping accounts adopted. It frequently happens that the expenditure of one department or fund, by a transfer, becomes the receipt of another department or fund. Thus if in making up the total of receipts and expenditures we simply take the sum of the individual items, some items will appear several times over, both as receipts and expenditures. The only way to avoid this error is to trace each item to its source, and in many instances the reports do not afford the data for so doing. The New York report affords an excellent example of confusion from this cause. The accounts are kept in two divisions: I. "The City Treasury;" II. "The Sinking Funds." Many of the receipts under the latter head, such as market rents, licenses, and railroad franchises, properly belong to municipal receipts. Other items, however, do not. Considerable amounts of the revenue bonds issued by the city were taken by the sinking funds, and the payments made when the bonds were taken, and the amounts received when they were paid off appear among the expenditures and receipts, helping to swell the total municipal income to over $92,000,000 (about $60 per capita!). Take another example. The "Sinking Funds" account is divided into two parts: I. "Sinking fund for the redemption of the city debt;" and II. "Sinking fund for the payment of interest on the city debt." The receipts under II amounted, in 1887, to $3,212,348.21; the actual payments to $146,409.61; and the balance of $2,950,000 was transferrred to I (debt redemption fund), appearing there again as a receipt. It would be easy to find numerous other illustrations in the same report and in the reports of almost every

other city. In the case of Baltimore the report of the Water Board shows transactions as follows: —

	Dr.	Cr.
By balance January, 1887,		25,095.91
By amount received from water rents and other sources,		745,445.96
By amount received from City Collector for water tax,		50,421.20
To amount paid in warrants of the Water Board for interest on loans,	472,630.00	
To salaries and other expenses,	340,875.15	
To balance December 31, 1887,	7,457.92	
	$820,963.07	$820,963.07

In the Controller's report the transactions figure as follows: —

RECEIPTS.

Water tax (included in the amount received from the City Collector),	50,421.20
From Water Board, from rents, etc.,	745,445.96
" " " interest on water loans,	472,630.00
Included in cash on hand,	25,095 91
	$1,293,593.07

PAYMENTS.

For Water Board,	813,505.15
For interest on water debt (included in interest on stock debt),	472,630.00
Included in balance on hand,	7,457.92
	$1,293,593.07

These transfers between different accounts render any use of the totals presented in the report unreliable.

The Registrar, in his report, distinguishes "Receipts — Actual Income," from "Receipts — Not Income;" but the distinction is not made according to any principle which renders it valuable for economic or statistical purposes. The principle seems to be to include under the first head receipts not applied by law to some specific purpose. Thus the receipts from street railway franchises and from assessments for opening streets (which by law are applicable to

certain specified purposes only) are included under "Receipts — Not Income."

In the case of the water works accounts the "water tax" is included under "Receipts — Actual Income;" "water rents" under "Receipts — Not Income." All the expenditures on account of water works are included under "Disbursements — Not Expenses." What we should like to know, but cannot find, is the receipts from water works and the expenditure for running expenses, interest, and new construction.

Another source of error, sometimes of considerable importance, illustrated in the Baltimore report, is the failure to deduct discounts on taxes from receipts, and the inclusion of such discounts among the expenditures.

These illustrations, taken at random, reveal the character of the difficulties which appear, and which, through their constant repetition, render it almost impossible to obtain accurate comparative statistics. Professor Richard T. Ely, who has collected a great quantity of financial statistics, in his work on Taxation in American States and Cities, finds it constantly necessary to warn his readers against the inaccuracy of available statistics. So great is the inaccuracy indeed as to render them practically worthless.

Judging by the Controller's reports, the receipts of New York, in 1887, were $92,138,426.09, while the receipts of Baltimore were $8,446,439, a disproportion evidently ludicrous. As already said, it is impossible for an outsider to wholly avoid the errors to which he is liable. The only persons who can do it successfully are the financial officers of the cities. It is not supposed that any city will abandon that method of account keeping which is best suited to its peculiar financial and administrative requirements, but would it not be possible to present, in connection with the usual report, a statement based upon some uniform classification applicable to all cities, which should reveal the actual character and significance of the financial transactions in a

way easily comprehended by the ordinary citizen, and at the same time valuable for economic and statistical purposes? The same obstacles to the statistical investigation of municipal finances presented themselves in Europe, and were made the subject of discussion at several sessions of the International Congress of Statistics. As a result of these discussions a formula was adopted in 1878, in accordance with which cities were requested to make their financial returns to a representative of the Congress, who was to tabulate the results in an annual bulletin.

A general account of each city's financial organization and administrative jurisdiction was recognized as a necessary introduction to these returns, changes in organization and jurisdiction to be noted in the reports of successive years. The classification adopted embraces two general divisions: A, Statement of receipts and expenditures; B, Statement of financial condition (assets and liabilities). The bulletin for 1883 contains returns from twenty-seven cities, including Paris, Berlin, Moscow, and Vienna, tabulated with reference to the principal sources of income and purposes of expenditure, and the different kinds of assets and liabilities, with supplementary notices of minor items peculiar to each city.

The majority of the cities accompany their statistical returns with notes explaining the various items in more or less detail. In the instructions accompanying the formulas prepared by the Congress, special emphasis is laid on the necessity of excluding "les sommes transitoires" which result merely from the method of keeping the accounts of the different branches of the administration. Sums collected for a third party, such as the state, were included under this head.

Expenditures, however, for third parties (such as the poor belonging to another town), and the repayment afterward received, should be included under expenditures and receipts. There was considerable discussion as to whether total receipts and expenditures or only the net result, whether surplus or

deficit, of such undertakings as water works and gas works should be included. It was finally decided that in the case of establishments which fall without the sphere of municipal administration, strictly speaking (banks, railroads, domains, mines, theatres), and of undertakings which have a commercial character, only the net profits or deficit should be counted. Municipalities were, however, requested to return separately the gross amount of their transactions in these directions, and this, on the whole, seems to be the most satisfactory method. It was also held that property having no salable value should not be included in the return of assets. This would, of course, exclude such public property as streets and bridges, while with regard to such property as museums and art galleries it was recommended that it be mentioned and described, but not valued.

There would be evident advantages in adopting for our American cities the same plan, which is already being carried out in Europe.

There are, however, certain general and characteristic differences between our cities and the cities of the old world, and it would perhaps be possible to prepare a formula better suited to our own needs, while at the same time affording a satisfactory basis of comparison with the cities reported in the "Bulletin Annuel," published by Körösi.

It is for this purpose that the following scheme is suggested: —

RECEIPTS.

I. Ordinary Municipal Revenue.

Balance on Hand.

Taxes.

a. General property tax.

b. Poll tax.

c. Liquor licenses.

d. Other licenses.

e. Other taxes (specify).

SPECIAL ASSESSMENTS.
a. Streets.
b. Sidewalks.
c. Sewers.
d. Other (specify).
MARKETS.
WHARVES.
RENTS.
FRANCHISES (specify general sources, and amounts from each).
PROFITS OF COMMERCIAL UNDERTAKINGS, *i. e.*, income after deducting running expenses and interest charge (specifying sources and amount from each).
INCOME FROM PRODUCTIVE INVESTMENTS (specifying sources and amount from each).
CURRENT INTEREST.
INCOME FROM PUBLIC INSTITUTIONS (correctional and charitable).
SUBSIDIES (from state or other political body; specifying source and amount).
OTHER SOURCES OF INCOME, which may be important, except income from loans, sinking funds, and foundations, or funds of which the city has only the administration.
MISCELLANEOUS RECEIPTS.
TOTAL.

II. RECEIPTS FROM LOANS.
a. Temporary.
b. Bonded.

III. RECEIPTS FROM FUNDS AND FOUNDATIONS, of which the city has the administration (specify).

IV. RECEIPTS FROM SINKING FUNDS, for payment of debt or other purposes (specify).

EXPENDITURES.

I. Expenses of Municipal Management and Construction.

Police.
- a. Current expenses.
- b. Construction.

Streets and Bridges (widening sidewalks).
- a. Cleaning and watering.
- b. Maintenance.
- c. Damages paid.
- d. Construction.

Public Lighting.

Fire Department.
- a. Current expenses.
- b. Construction.

Sewers.
- a. Current expenses.
- b. Construction.

Schools.
- a. Current expenses.
- b. Construction.

Public Assistance and Institutions.
- a. Outdoor relief.
- b. Institutions (including correctional).

Deficit in Commercial Enterprises, *i. e.*, amount necessary to supply from general revenue to meet running expenses and interest charges (specify enterprise and amount).

Markets.
- a. Current expenses.
- b. Construction.

Wharves.
- a. Current expenses.
- b. Construction.

Health Department.

PUBLIC BUILDINGS.
a. Current expenses.
b. Construction.
PARKS.
a. Current expenses.
b. Construction.
ACQUISITION AND CONSTRUCTION FOR OTHER PURPOSES (such as commercial enterprises; specify purpose and amount).
INTEREST PAYMENT (deduct interest already counted as a charge upon commercial enterprises).
a. Bonded debt.
b. Temporary debt.
EXPENDITURES FOR OTHER IMPORTANT PURPOSES (specify purpose and amount).
MISCELLANEOUS EXPENDITURES.
TOTAL.

II. DEBT PAYMENT.
a. Bonded.
b. Temporary.

III. EXPENDITURES IN CONNECTION WITH FUNDS AND FOUNDATIONS, of which the city has the administration (specify).

IV. PAYMENTS TO SINKING FUNDS.
BALANCE ON HAND.

Statement of gross transactions on account of commercial enterprises.

Sinking Fund Statement.

Amount of funds at beginning of year, including cash balances.

RECEIPTS from —
Interest on investments.
Investments paid off.
City treasury.
Other sources (specify).

EXPENDITURES for —
Payments to city treasury.
Debt redeemed.
Investments.
Other purposes (specify).
Amount of funds at end of year, including cash balances.

ASSETS AND LIABILITIES.

ASSETS.

I. AVAILABLE.
Cash in treasury.
Sinking funds.
Salable lands and buildings.
Taxes, assessments, etc., in arrears.
Other debts due.
Other available assets (specify).

II. NOT AVAILABLE.
Water works.
Gas works.
School houses.
Public buildings.
Parks.
Other assets not available (specify).

LIABILITIES.
Debt.
a. Bonded.
b. Temporary.
Outstanding claims.
Other liabilities (specify).

The above scheme needs a word of comment and explanation. All receipts should be included, whether or not legally applicable to some special purpose or fund. In the case of such legally required application the corresponding expenditure should of course be included.

Great care should be taken to exclude all receipts and expenditures arising merely by transfers between different accounts; no item should be counted more than once as receipt or expenditure.

All receipts or expenditures of a given kind (licenses, for example) should be collected under the specified heading, though they may be credited or charged to different departments of the administration. This statement needs some modification, however. A conflict may exist between the different headings. The markets or waterworks may derive a portion of their regular income from rents, or permits analogous to licenses. In such a case the disputed item should be included under the more specific heading, *e. g.*, market rents should be included under "Markets." It is the same with regard to expenditures, *e. g.*, the expenditure for building a police station should be included under "Police," and not under "Public Buildings," which latter would include only such items as had not been included under more specific headings. "Taxes" and "Assessments" should include interest paid upon arrears, but all refunds, discounts, and taxes collected for the state should be deducted. The term "License" should be interpreted broadly, including such items as building and surveyors' permits.

Payments by such corporations as street car companies, gas companies, and ferry companies, should be included under "Franchises," whatever may be the technical term for the payment. In estimating the income or deficit of commercial enterprises, comparison should be made between receipts from operation and running expenses, including interest on the debt.

Salaries should be included in the expenditures under the different headings. In the case of some cities, however, on account of the character of the administrative organization, it may not always be possible to apportion salary payments in accordance with the above plan. In such instances the amount paid in salaries, and the general duties of the officers

to whom payment is made, should be stated. Payments for quarantine and small-pox hospitals, scavenger work, and removal of garbage should be included under "Health Department."

Any peculiarities of administrative organization not made evident in the accompanying statement, and affecting the character and scope of municipal finance, should be noted.

If, in connection with their regular reports, controllers and auditors would present a statement in accordance with the above plan, it is believed that it would afford information valuable both for general and scientific purposes. Even if it were impossible to prepare a statement with the detail proposed, a presentation classified according to the general headings given would be of value as affording a more satisfactory basis of comparison between different cities than we now have.

It is believed that a statement compiled in accordance with this plan would afford a clear exposition of a city's financial transactions and condition, and would yield valuable material for economic and statistical study. Nor would it impose a great burden upon auditors and controllers. It is very desirable that the statements should be made as much in detail as possible, but valuable results would follow if only the main headings were observed. The most important point, and that requiring the most care, would be to avoid the errors already referred to. In the receipts from taxes, taxes paid over to the state or other political body, refunds, and discounts should be deducted. Care should be taken to collect, under a given head, all the items which belong there, though, as is frequently the case in the customary method of presenting reports, they may be scattered through several departments. The interest charge on any debt incurred in connection with any commercial enterprise should be counted with the running expenses. If it is not so counted the fact should be noted.

In connection with special funds and foundations their

character, amount, and purpose should be stated. In general the greatest care should be taken to avoid including receipts and expenditures which arise merely by transfers between accounts. No item should appear more than once, either as a receipt or expenditure. Only in this way can the statement present an accurate view of actual transactions. It is also important to note any peculiarity of condition or administration which may affect the character or amount of financial transactions.

NEWSHOLME'S VITAL STATISTICS.

The Elements of Vital Statistics. By Arthur Newsholme, M. D. London: Swan Sonnenschein & Co. xxiv, 326 pp. 8vo.

This is essentially a manual for the use of English sanitary officials, compiled from the writings of Drs. Farr and Ogle, in the reports of the Registrar-General, with illustrations of methods, of tabulations, and of deducing conclusions for preventive medicine, drawn from the English Registration reports, and especially from those of Brighton, of which place Dr. Newsholme is the Medical Officer of Health. The bibliography given includes English authorities only, with the exception of two French works by Quetelet and Gavarret, the last author being given as Gavanet, and the title of his book erroneously quoted. As the author states that the work is prepared especially for the use of junior Medical Officers of Health, and of those preparing for examination for certificates of proficiency in sanitary matters, this limitation of scope is quite proper, and the material available for its preparation is ample and of the best quality. His claim that there is no country in the world which possesses so rich a mine of information as England, in the field of vital statistics, is certainly well founded, and every year adds in an increasing ratio to the value and importance of the records of the Registrar-General's office.

These records, with the comments upon them by Farr, Ransome, Ogle, Humphreys, Buchanan, and others, form much the larger part of the scientific foundation of modern sanitation, and familiarity with them is absolutely essential to every one who is concerned with problems of vital statistics, and especially with those which relate to mortality rates. This book is an excellent summary of the more important conclusions which have thus far been derived from these sources, indicating the more common fallacies which are liable to destroy or lessen the value of the work of the uninstructed investigator, the methods of comparison which have been found most useful, and some of the results considered, more especially from a sanitary point of view. In referring to it, it is necessary sometimes to bear in mind the particular locality for which it is prepared, for some of the recommendations do not apply elsewhere; but, upon the whole, it is the best manual of the subject now in existence. In the first chapter the census and methods of estimating population are discussed, and if this were carefully studied by some of our municipal statisticians, and the rules followed, it is safe to say that the annual reports would show less population, and therefore higher death rates, than they usually do in the intervals between census years, and would thus be nearer the truth. The desirability of a quinquennial census is pointed out, and it is needed in this country even more than it is in Great Britain.

The system of registration of births and deaths, in England, is described in the second chapter. A certain proportion of births, between one and two per cent, escape registration, but the omissions to register deaths are probably very few. The chief defect in the registration of deaths is that in between three and four per cent of the cases the cause of the death is not certified, either by a physician or by the results of an inquest. A chapter is devoted to the registration of disease, and especially to the compulsory notification of certain infectious diseases, of which the author, in common with most health officers, is a strong advocate. As the practical utility of such notification depends largely on the provision of special hospitals for the diseases to which it is applied, and as most towns in England, as well as in this country, have no such provision, it is difficult as yet to judge of the real value of the system.

In successive chapters the influence of age, sex, climate, marriage, density of population, occupation, etc., upon mortality rates are discussed and illustrated, the influence of vaccination upon small-pox is

shown, the methods of constructing life tables are briefly indicated, army and navy statistics are given, and the whole closes with a chapter on statistical fallacies, which is one of the best in the book.

From this brief summary it will be seen that Dr. Newsholme has done a good and useful piece of work, and that his book is one which all registrars and sanitary officials should have at hand for reference.

J. S. BILLINGS.

AMERICAN WATER-WORKS.

The Manual of American Water-Works, compiled from special returns: Containing the history, details of construction, source and mode of water supply, pumping machinery, distribution, consumption, pressures, hydrant rental, revenue and expenses, cost and debt, etc. M. N. Baker, Ph.B., editor, 1888. Published by *Engineering News*, New York, 1889. Pp. lxxxvii, 611.

From many points of view, this is one of the most valuable pieces of statistical work which we have seen of late. It is now eleven years since the projectors of this work commenced to collect statistical data on this subject, under the direction of Mr. J. J. R. Croes, and several issues have appeared of his *Statistical Tables of American Water-Works*. These, however, really consisted of but a single table, in which the water-works were classified alphabetically and by states, with data as to population, date of completion, and various engineering and financial details, but without any comments, discussions, or general comparisons or conclusions.

The present issue, which constitutes a closely-printed volume of about 700 pages, is a vast improvement on the above, and of entirely different character. In it each city or town provided with works for water supply is separately considered, and full but concise details given, covering all the points of interest, or for which information was attainable. And, what is of much greater importance, this portion of the work is preceded by an excellent general discussion of the subject, in which comparisons are drawn between the different

sections of the country. In its present form, indeed, the work aims to do for the water-works of the country what Poor's *Manual of Railroads* does for the railways, and it does it remarkably well, and in a way which, for execution and completeness, will easily bear comparison with that excellent and standard work, notwithstanding the fact that this is the first issue, and therefore necessarily to some extent incomplete and not up to the standard to which its projectors will no doubt soon bring it.

The detailed information regarding each works will naturally be of interest principally to engineers and others actively engaged in water-works matters. With these the book must at once take its place as a standard work of reference. But the general introduction, which covers 87 pages, is of value to all who are interested in statistical discussions, and it is worth while to refer to some of the facts which it brings out. The states and territories are grouped, as in Poor's *Manual*, into eight groups, to which are added two more, covering the provinces of Canada; and for each of these groups, and afterward for the entire United States and Canada, tables are given and compared with each other, showing the progress of construction, capital invested, miles of mains, number of taps, hydrants, and meters, population statistics, revenue, kind of works and sources of supply, pressures, ownership, hydrant rental, pumping machinery, reservoirs, and consumption. One of the most interesting and almost startling facts shown is the enormous increase in the number of works in recent years. It appears, for instance, that in New England over one half of all the works now existing have been constructed within eight years, and over 27 per cent within two and a half years; while in the entire United States 1037 out of a total of 1666, or over 62 per cent, have been built since 1880. Very interesting are the figures regarding total population supplied, and a comparison of this with the total town population; but since the figures regarding population have necessarily been taken in most cases from the census of 1880, the results are in many cases unreliable and misleading, as the editor is careful to remark. The statistics as to capital invested, and revenue, are likewise of value, and it appears that in New England the total cost of the works has been about 85 million dollars, or a little less than one quarter of the amount invested in railroads; while in the entire United States the total capital invested is 432 million dollars, or nearly one tenth of that invested in railroads. The gross

revenue is 7.54 per cent of the cost in New England, and 9.11 per cent in the entire United States, the net revenue being generally indeterminate.

The statistics of kinds of works, and sources of supply, especially when studied in connection with the topography of the country, afford much that is of interest. Thus, in New England gravity supplies constitute 50 per cent of the total; in the middle states, 42 per cent; in the southern states, 13 per cent; and in the northern central states less than 5 per cent; while in the same northern central states over 93 per cent of the works are supplied by pumping. Again, in New England almost all the supplies are derived from surface water, less than one per cent being derived from wells; while in the northern and northwestern states over 44 per cent of the supplies are from wells.

The progress of the western states in the construction of waterworks is remarkable. Before 1881 there were only about 100 works in the states west of the Mississippi (exclusive of Louisiana), while since that date nearly 400 have been built, and many more are projected.

It will be evident that the compilation of this volume has involved a vast amount of labor, and its merit will doubtless be recognized on all sides. In the face of so much that is excellent, and remembering that this is the first annual issue of what will hereafter be a regular publication, one does not feel much inclined to criticise. Yet it is to be regretted that the general discussions to which we have alluded are not illustrated by maps and diagrams. No method is equal to the graphical in clearly representing to the mind a mass of statistical information such as is here collected, and it is to be hoped that in future issues this will be recognized, and that not only maps (which are promised) but diagrams will be freely used. If these are added the work will be nearly perfect of its kind.

G. F. Swain.

CHRONICLE FIRE TABLES.

The Chronicle Fire Tables for 1889: *A record of the fire losses in the United States, by risks, states, and causes, during* 1888, *with exhibits of the monthly, annual, and aggregate fire losses in the United*

States during fourteen years (1875–1888), *and much other interesting and valuable information for fire underwriters.* New York: The Chronicle Company, limited, 1889. Pp. 264.

The fifth issue of the Chronicle fire tables annual has appeared with commendable promptness. The title heading indicates quite fully the range of information presented. The authors are modest in their claims. "As to the property losses there is no method whatever to ascertain their degree of correctness, as the exact annual waste by fire in the United States is an unknown quantity." The Chronicle's estimates exceed the official reports by from two to five per cent. It is stated that the discrepancies between the insurance losses in the different states, as given by the insurance departments and by the *Chronicle Fire Tables*, are mainly due to losses incurred on goods in transit, vessels at wharves, etc. Three sources of information have been made use of: (1) Reports from the fire departments; (2) reports from fire insurance agents; (3) a study of the reports of fires published in local newspapers. The aggregate annual losses in the United States, for fourteen years, 1874–1888, is as follows:—

Year.	Aggregate Property Loss. Millions of Dollars.	Aggregate Insurance Loss. Millions of Dollars.
1875	$78.1	$39.3
1876	64.6	34.3
1877	68.2	37.3
1878	64.3	36.5
1879	77.7	44.4
1880	74.6	42.5
1881	81.2	44.6
1882	84.5	48.8
1883	100.1	54.8
1884	110.0	60.6
1885	102.8	57.4
1886	104.9	60.5
1887	120.2	69.6
1888	110.8	63.9
	$1,242.5	$695.2

The causes of fires in 1888 furnish an interesting and very detailed tabulation. In *The Chronicle* for May 23, however, these are summed up and assigned thus:—

Causes.	Per cent.
Inherent,	13.1
Direct,	7.4
Remote,	30.0
Fraudulent,	7.8
Unknown and not reported,	41.7
	100.0

It is explained that "remote cause" is but another name for exposure. Elsewhere in *The Fire Tables*, p. 11, it is stated that —

It seems to be a well-settled fact, and may be accepted as one of the laws which mark the fire rate in the United States, that the average fire will damage or destroy not only the property in which it originates, but seven eighths of an adjacent risk. The conclusion seems plain that with the present style of construction there is very little basis for the hope that the loss through exposure will be materially reduced.

Some suggestive curves and charts are also included in this publication. Especially interesting is the curve which shows the distribution of incendiary fires by months. A comparison in curves is made between 1888 and the "average for five years, 1883–87;" and in only two months, in July and December, did the monthly number of incendiary fires exceed the average for five years. Each curve is depressed in a marked degree in February and June, from which time it climbs steadily upward until December is reached. The fire map charts showing the geographical distribution of incendiarism in the past five years would furnish a forcible study of sociological conditions.

TWO COMMERCIAL GEOGRAPHIES.

Commercial Geography: Based on the latest researches and statistical returns. A complete manual of the countries of the world, their chief centres of trade, their natural productions, mineral resources, exports, manufactures, etc. By Carl Zehnden, Professor in the Handels-Academie of Vienna. Translated by Findley Muirhead, M. A.,

from the fifth German edition, revised for translation by the author. With a map of the chief trade routes. London: Blackie and Son. 1889. Pp. 600.

Elementary Commercial Geography: A sketch of the commodities and the countries of the world. By Hugh Robert Mill, D. Sc. Cambridge: University Press. 1888. Pitt Press Series. Pp. 132.

These two volumes in a measure illustrate the recent development now taking place in England, in a demand for an enlargement of the school curriculum in directions which will the more quickly prepare youth for business careers. Commercial geography has long been an important study in German schools, and, of late, English merchants have complained of the competition they suffered in foreign countries on account of the more technical education of German youth in matters of trade. Chambers of Commerce are taking up the complaint with considerable energy, and the book trade has responded to the demand with commercial promptness. The work of Prof. Zehnden is well known on the continent, where it has been in use for twenty years. The statistics are carefully stated, and are brought down to a late date. There are a few slips in the section devoted to the United States. Compulsory education is hardly exacted in "nearly every state with exemplary vigor." In stating the areas of the several states of the Union the author has not availed himself of the latest estimates of the Commissioner of the General Land Office. So, too, the statistics for the number of horses in this country are antiquated. In its general treatment the author follows the plan of taking up the countries consecutively, and presenting the principal facts regarding each. It is hardly a method which will arouse a student's interest or curiosity, and gives the work too much the character of a statistical abstract. For students the plan followed by Mr. Mill appears to me to be preferable. Mr. Mill's little volume is essentially a primer, but within its limits the author finds opportunity to compare the different countries in respect to the leading commercial products. In this way a student can obtain a very fair idea of the statistical situation of the staples of trade. Mr. Mill's statistics, as far as I have examined them, are not so accurate as are those in Prof. Zehnden's work. They are oftentimes given loosely, and in many cases no year whatever is assigned for the estimates. The annual production of zinc, tin, copper, or lead is not by any means constant. It is erroneous to

say that the annual production of all countries for copper is 200,000 tons, of which the United States furnishes 70,000 tons. The production of copper has more than doubled in our country in the brief period 1882–86; and in 1888 amounted to more than 100,000 tons. The production of lead in the United States is also under-estimated. We have to go back to 1882 to find as low a production of cotton as Mr. Mill reports. The author is misleading in stating under coinage (U. S.) that notes are issued by the Governments of the several states. Considering, however, the great amount of useful information presented in this little work, and the purposes for which it is designed, the inaccuracies quoted should not destroy its general value.

D. R. D.

ENGLISH LABOUR STATISTICS.

Labour Statistics: Copy of memorandum explaining the progress made in carrying out the arrangements for collecting and publishing statistics relating to labour, as described in Return No. 48, *of Session* 2, 1886. Board of Trade, December, 1888. London: Henry Hansard & Son. Pp. 13.

Little has ever been done in England toward the collection of labor statistics. Gradually, however, the demands of the workingmen for official inquiries and information is making itself felt, and in 1886 the Board of Trade was intrusted by Parliament with the commission of organizing a department for collecting and publishing labor statistics. This inquiry was made to include the subjects of wages in England and abroad; savings, prices, hours of labor, etc. Since that date some progress has been made, but evidently the demand for the inquiry is not yet regarded as a very serious one, for at no time apparently had there been a staff of more than eight or ten at work upon it. The present memorandum is principally a communication giving a list of parliamentary papers and notices published in 1883 and 1888 in the Board of Trade Journal, on labor statistics. There is also a statement showing the number of forms issued and returns

made. It appears that out of 78,988 forms sent out to 171 trades there have been replies to but 10,603. It is announced that there will shortly be published volumes on *Returns of Expenditure by Working Men; Official Records of Wages for the last fifty years;* and *Strikes and the history of labor questions generally in* 1888. It is also proposed that the *Report on Trades Unions* (1st, 1887, 2d, 1888) shall be made an annual one, and that the *Report on Strikes*, yet to be issued, shall appear annually. It is interesting to note that a large portion of Prof. Richmond M. Smith's *Essay on Wage Statistics and the next Census of the United States*, first presented to the American Statistical Association, and printed in the *Quarterly Journal of Economics*, is here reprinted.

INDEX OF JOURNAL OF ROYAL STATISTICAL SOCIETY.

Journal of the Royal Statistical Society. General Index (Part IV) to Volumes XXXVI to L (1873–87), *in continuation of the three previous general indexes.* (1) *Vols. I–XV* (1838 *to* 1852). (2) *Vols. XVI–XXV* (1853–62). (3) *Vols. XXVI–XXXV* (1863–72). London: 1889. Pp. v, 283.

The Royal Statistical Society has now published the fourth of its extremely useful indexes, bringing the indexing down to the close of 1887. This last publication contains a general index to volumes 36–50 (1873–87) of the Society's Journal, a list of papers read from the commencement, in 1834, to the end of 1887, classified by subjects; and the list of papers arranged under their respective authors. The index is constructed on a sensible principle, so as to aid the investigator in a most helpful manner. It speaks much for the wisdom of the author of the first index that it has not been necessary to change the plan originally adopted. The indexes are thus uniform and easily examined.

TABULATION OF STATISTICS.

In *The School of Mines Quarterly* (Columbia College), for April, 1889, there is published an article entitled "An Electric Tabulating System," by H. Hollerith. An abstract of a portion of it is reprinted.

Few who have not come directly in contact with a census office can form an adequate idea of the labor involved in the compilation of a census of 50,000,000 persons, as was the case in the last census, or of over 62,000,000, as will be the case in the census to be taken in June, 1890. The fact, however, that Congress, at its last session, in "An Act to provide for the taking of the eleventh and subsequent censuses," fixes the maximum cost of the next or eleventh census, exclusive of printing and engraving, at $6,400,000, will perhaps impress one with some idea of the magnitude of such an undertaking.

Although our population is constantly increasing, still, up to the present time, substantially the original method of compilation has been employed, — that of making tally-marks in small squares and then adding and counting such tally-marks.

The work of a census can be divided into two main branches,— that of enumeration and that of compilation or tabulation. Referring to the records of the tenth census, we find the cost of the enumeration to have been $2,095,563.32, and the expenses of the office of the Superintendent of the Tenth Census, at Washington, $2,385,999.50. If the same methods of compilation are to be employed in the next census, the *per capita* cost of compilation would, of course, remain substantially the same, so that, allowing for the increased population, the expenses of this portion of the work would amount to $3,101,799.67. If, however, the data enumerated at the next census is compiled with that fullness and completeness which it deserves, and which it ought to receive, this expense would far exceed the above amount.

The population schedules of the tenth census contained the following inquiries, the replies to which were capable of statistical treatment: Race; Sex; Age; Relationship to head of family; Civil or conjugal condition; Whether married during the census year.

Occupation; Number of months unemployed; Whether sick or otherwise temporarily disabled; What was the sickness or disability? Whether blind, deaf and dumb, idiotic, insane, maimed, crippled, bed-

ridden, or otherwise disabled; Whether the person attended school during the census year; Cannot read; Cannot write; Place of birth; Place of birth of father; Place of birth of mother.

Many of the facts enumerated in the tenth census were not compiled at all, or, if compiled, were treated in so simple and elementary a manner as to leave much to be desired. Thus, for example, it is today impossible to obtain the slightest reliable statistical information regarding the conjugal conditions of our people, though the complete data regarding this is locked up in the returns of the enumeration of the tenth census.

To know simply the number of single, married, widowed, and divorced persons among our people would be of great value; still it would be of very much greater value to have the same information in combination with age, with sex, with race, with nativity, with occupation, or with various sub-combinations with these data.

If the data regarding the relationship of each person to the head of the family were properly compiled, in combination with various other data, a vast amount of valuable information would be obtained. So, again, if the number of months unemployed were properly enumerated and compiled with reference to age, to occupation, etc., much information might be obtained of great value to the student of the economic problems affecting our wage-earners.

Another illustration will be given. We have, in a census, besides the data relating to our living population, records regarding the deaths during the previous year. In both cases we have the information regarding age and occupation. If the living population were tabulated by combinations of age and occupation, and likewise the deaths by ages and occupations, we would then have data from which some reliable inferences might be drawn regarding the effects of various occupations upon length of life. It might even be possible to construct life tables for the various occupations, as we do now for the different states and cities. Such information would be of service in relation to life insurance and other problems. Again, it would point out any needed reforms regarding the sanitary conditions and surroundings of any occupation. This is a field of statistical investigation which is as yet almost wholly unexplored.

If at the eleventh census no material improvements are adopted in the methods of tabulation, it will probably be found impossible to

accomplish more than that at the tenth census on account of the time and expense involved.

In place of the traditional methods of tabulation it is suggested that the work be done, so far as possible, by mechanical means. In order to accomplish this, the records must be put in such shape that a machine could read them. This is most readily done by punching holes in cards or strips of paper, which perforations can then be used to control circuits through electro-magnets operating counters, or sorting mechanism, or both combined.

Record-cards of suitable size are used, the surfaces of which are divided into quarter-inch squares, each square being assigned a particular value or designation. If, for example, a record of sex is to be made, two squares, designated, respectively, M and F, are used, and, according as the record relates to a male or female, the corresponding square is punched. In similar manner other data, such as relate to conjugal condition, to illiteracy, etc., are recorded. It is often found, however, that the data must be recorded with such detail of specification that it would be impracticable to use a separate space for each specification. In such cases recourse is had to combinations of two or more holes to designate each specification.

These punched record-cards are then treated in certain electrical apparatus, which consists essentially of a press or circuit-closing device, a series of electro-mechanical counters, and an electrical sorting mechanism.

The press is provided with a number of projecting spring-actuated contact-points, so arranged that if a card is placed in the press circuits will be closed through the punch holes operating the corresponding counters or sorting mechanism. The counters can be so connected or reconnected that any given counter will count any desired item or combination or group of items. The sorting mechanism is so arranged that, as the cards leave the press, they are automatically assorted according to any desired series of items, combinations or groups of items.

It is, of course, apparent that the number of items or combinations, which can be counted at any one time, is limited only by the number of counters, while at the same time the cards are sorted according to any desired set of statistical facts.

In a census the cards, as they come from the punching machines, would, of course, be arranged according to enumeration districts.

Each district could then be run through the press, and such facts as it is desired to know in relation to this unit of area, could be counted on the counters, while the cards are at the same time assorted according to some other set of facts, arranging them in convenient form for further tabulations. In this manner, by the arrangement of a judicious "scheme," it will be found that a most elaborate compilation may be effected with but a few handlings of the cards.

CONVENTION OF COMMISSIONERS OF BUREAUS OF STATISTICS OF LABOR.

Through the courtesy of Hon. Horace G. Wadlin the following condensed report of the proceedings of the recent Convention of the Commissioners of Bureaus of Labor Statistics has been furnished to the American Statistical Association. Later on the proceedings in full will be published by the Convention, and, until the limited edition is exhausted, may be obtained upon request of either of the Bureaus.

The Seventh Annual Convention of Chiefs and Commissioners of Bureaus of Statistics of Labor in the United States met in the Senate Chamber at the State Capitol, Hartford, Conn., Tuesday, June 25th, at two o'clock, the President, Carroll D. Wright, of the Department of Labor, Washington, D. C., presiding.

The following Commissioners were present: E. R. Hutchins, of Iowa (Secretary of the Convention); S. W. Matthews, Maine; Horace G. Wadlin, Massachusetts; J. B. Bowditch, Rhode Island; S. M. Hotchkiss, Connecticut; Edward J. Keene (Deputy Commissioner), New York; James Bishop, New Jersey; A. S. Bolles, Pennsylvania; H. M. Stark, Wisconsin; A. H. Heath, Michigan; John S. Lord, Illinois; John Lamb, Minnesota; Lee Meriwether, Missouri; John Jenkins, Nebraska; and F. J. Betton, Kansas.

In opening the Convention the President, Col. Wright, congratulated the members upon the generosity of the state in permitting them to use the Senate Chamber.

The interest in the work of the Bureaus has increased. It has been well supported by manufacturers and workingmen, and has the confidence of all classes. The Bureaus are contributing much to political science and to political economy. They are not created to solve great problems, but to report facts without prejudice.

The work has many difficulties. Its limitations are so many as to be discouraging to statisticians. We can only endeavor to do our best, and exercise care that we present nothing that does not have a solid foundation. It has been said that figures will not lie. It is equally true that liars will figure. It is our duty to prevent liars from figuring in the interest of any theory, by presenting original data fairly.

Hitherto in our conventions we have had papers on abstract topics, but it has been deemed best to devote most of this session to discussing the obstacles in the way of gathering statistics,— the principal work of the Bureaus. Investigations, if possible, should be on several lines leading to a common result, and not confined to one view of the subject. The speaker illustrated common fallacies in statistical investigation. He showed that averages, as usually secured, were very misleading. He alluded to the difficulty of securing accurate answers to schedule questions. The average manufacturer, he said, finds it difficult to answer accurately the questions asked him. Such representative facts as can be secured are better than average facts. In illustration of his statements respecting limitations surrounding statistical investigation, he alluded to statistics of arrests for drunkenness under license and prohibition, as collected some years ago in Massachusetts. The result showed more arrests for drunkenness under prohibition than under license. This result, however, was misleading, as the state of affars was largely due to the prejudice of the police in large cities against prohibition, which caused them to arrest every drunken man, while under license they were lax in making arrests.

Many limitations surround the collection of data relating to the cost of production. Our consular agents have worked for years on this line, but have made little progress. There is so much prejudice encountered that different elements of cost are introduced. The only way to secure accurate results is to prepare so extensive blanks that the manufacturers cannot deceive skillful statisticians. This is the true work of the Bureaus. In England and France the manufactur-

ers have thrown their books open to investigators, and, with the co-operation of Congress and the various legislatures, we may hope for excellent results in this country. It is particularly the work of this Convention to discuss obstacles and limitations.

The election of officers for the ensuing year resulted as follows: President, Carroll D. Wright, Washington, D. C.; Vice-President, Samuel M. Hotchkiss, Hartford; Secretary, E. R. Hutchins, Des Moines, Iowa.

It was unanimously voted to hold the next meeting at Des Moines.

The President called upon Senator Hawley, of Connecticut, who was present, for suggestions and criticisms. The Senator said: He would not venture suggestions to men who had made these matters the subject of long study, and he could not criticise their action in advance. He would not place implicit confidence in the bare figures of statistics. They must be studied with a knowledge of the limitations surrounding their collection. Whether absolutely correct or not, one sometimes finds them as fascinating as romances. He referred to the scope and variety of Mulhall's various works,— Dictionary of Statistics, History of Prices, etc., and quoted his conclusion that the American workman is the most productive, man for man, because he is the best fed, housed, clothed, paid, and educated. It might have been added that there is another element of his condition that cannot be told in figures or tabulated,— his hope and assurance that, if he will, he may better himself. He spoke of the pleasure it gives studious men to see the advances made by these organizations toward better statistical work, and had no doubt their labors would assist social and economic improvement.

Senator Platt, of Connecticut, was called upon for remarks:

He welcomed the Convention, and dwelt forcibly upon the true end and purpose of the statistical bureaus getting established in state after state. He declared it to be to ascertain the actual relative position, rights, and duties of the real workingman, and his readjustment in his proper, satisfactory, and happy relations.

Prof. Arthur T. Hadley, Ex-Labor Commissioner of Connecticut, said many a manufacturer, when asked for information, wanted to know first, whether the sympathy of the statistician was on his side. He congratulated the various Bureaus on the advance which had been made in the work of collecting statistics.

The President then called for reports from the different states.

He himself reported that the National Department of Labor was about to issue statistics relating to workingmen, in twenty-two of the largest cities,— a book of over 500 pages. It has also in press a volume of statistics on marriage and divorce in the United States. The period covered was from 1866 to 1887, and experts have been at work all over the country obtaining the information desired. When it is remembered that there are 2700 courts in the United States having divorce jurisdiction, the difficulties encountered can be imagined. Few of the states have a complete system of registration of marriage, so this work is necessarily incomplete. Even in Connecticut the number of marriages celebrated falls short of the number of licenses issued by ten per cent.

Commissioners Albert S. Bolles, of Harrisburg, Pa.; Lee Meriwether, of Missouri; James Bishop, of Trenton, N. J.; and E. J. Keene, of New York, reported their experiences.

EVENING SESSION.

When the evening session was called to order Mr. Jenkins, of Nebraska, moved that the proceedings of the Convention be published, but that, before publication, the report and remarks of each delegate be submitted to him in proof for revision. Mr. Bolles, of Pennsylvania, was of the opinion that the proceedings were of little interest to the general public, and regarded it as a waste of money to print them. Mr. Betton, of Kansas, thought the reports of proceedings were valuable, and he had used them every year to help him in making up his report. The Secretary said he regarded the published proceedings as very valuable. Mr. Hotchkiss, of Connecticut, had found the published proceedings of much help to him in furnishing hints for his own investigations. He thought that such documents would be read by the people more than would be the heavier works on the subject, and thereby information on the work of the Bureaus will be diffused. The motion was adopted.

The business of the meeting was then taken up where the afternoon adjournment interrupted it. Mr. Lord, of Illinois, spoke of the methods on which the business of his State Bureau is conducted. He had been engaged in collecting statistics of mortgage indebtedness, and proposed to conduct further researches on the same line. He was followed by Mr. Wadlin, of Massachusetts, who said that his Bureau had been engaged in completing, for publication, the results

of the Decennial Census of the State, the final volume of which, that relating to manufactures, was now in press for immediate issue. Besides this the Bureau would soon issue its Nineteenth Annual Report, containing two parts, the first relating to strikes in Massachusetts during the period 1880 to 1886; the second to citizens and aliens. This last part would present a statistical picture of the composition of the voting and alien population of the state, and would trace the effect of naturalization, and the bearing which the growth of manufactures, and the immigration incidental thereto, had upon political citizenship in the Commonwealth. Work upon the Twentieth Report was also progressing, and related chiefly to wages and cost of production; markets in which Massachusetts products are sold, and means of transportation thereto; and the condition of operatives in their homes and employments.

Mr. Heath, of Michigan, reported that his Bureau was this year investigating wages, number of people depending on each wage-earner, the cost of living, etc.

Mr. Stark, of Wisconsin, made a brief report on the labor work in his state, and introduced his deputy, Matt J. Simpelaar, who presented a tabulated statement of the comparative purchasing power of wages in different countries. It was shown that wages in this country, or in his state as indicative of the country, had nearly double the purchasing power of the average wages of France, England, Germany, Belgium, Denmark, Sweden, Italy, and Holland.

Mr. Hutchins, of Iowa, the Secretary, said one subject he was interested in, and was investigating, was the amount of deposits in savings banks.

A recess was here taken, and the members were individually introduced to Gov. Bulkeley, of Connecticut, who had entered the Convention.

When the Convention was again called to order Mr. Hotchkiss, of Connecticut, spoke, and was followed by Mr. Matthews, of Maine. During the past year Mr. Matthews had been investigating the subject of child labor and female wage-workers. At the conclusion of Mr. Matthews's remarks the Convention took a recess until 9.30, Wednesday.

On Wednesday, June 26th, the work of the Bureaus was further explained, beginning with Mr. Lamb, of Minnesota. He intended

to take up the eight-hour movement, strikes, and wages as related to the cost of labor and production.

Mr. Bowditch, of Rhode Island, said his Bureau had at first met the antagonism of the manufacturers, but was now in better standing. He was investigating the conditions of working women, child labor, and school attendance.

Mr. Jenkins, of Nebraska, said that during the coming year he should devote his time to the consideration of the conditions surrounding the sugar-beet industry.

Mr. Betton, of Kansas, spoke of his success in getting a larger appropriation for his Bureau. As to methods, blanks requiring voluntary answers by mail from workingmen involved just so much money thrown away for stamps. He now makes personal examinations. The past year he had investigated the condition of the workingmen. He was now engaged in an examination of the dressed beef problem as related to workingmen. The allegation on which the dressed beef legislation is based is that the combine reduced the price of live stock until the farmers were producing at an actual loss, while the consumer was paying more than ever. The legislation provided for an inspection of cattle where killed, thus insuring a return to drovers, slaughter houses, and preventing slaughtering at the packing factories. In many of the western states such legislation had been almost successful. Mr. Betton gave figures showing that prices of meat had generally risen, although there were exceptions, while the prices of hides and tallows had declined, the former 64 per cent and the latter 50 per cent. Local butchers complained that they frequently had to throw away poor pieces. Everybody wanted the best cuts. The less desirable parts were often bought very cheaply at the packing houses by the consumer. In Europe one part of the carcass sells for about the same price as another. He went into an elaborate presentation of the meat supply of the world, showing the great quantity sent to Europe from the Argentine Confederation, Canada, Australia, and New Zealand. Notwithstanding all this the price of corn-fed cattle from the United States is at the highest. The farmer can no longer make grass feed profitable, but in corn feed he has yet a monopoly, despite combines. The consumer pays more for beef than he should, when we consider the price paid to the producer.

Mr. Bowditch asked if the placing of hides on the free list had anything to do with the reduction of prices.

Mr. Betton said he had made no investigation upon that point.

This finished the call of states. Col. Wright said that Bureaus generally were poorly equipped with men and means, and that therefore apparatus to save time and money in tabulation was of great importance. He invited Herman Hollerith, of Washington, to explain his electrical tabulating machine. This was done in the ante-room, where the apparatus had been set up. This method consists, essentially, in first recording the data relating to each person by punching holes in sheets or strips of electrically non-conducting material (paper), and then counting or tallying these data, either separately or in combination, by means of mechanical counters operated by electro-magnets, the circuits through which are controlled by the perforated cards or strips. To tabulate any of the facts recorded on the cards it is only necessary to connect the corresponding binding posts of the press with the binding posts of the counters, and then pass the given cards, successively, through the press, when the results will be shown directly on the counters. The number of facts thus recorded at one operation is only limited by the number of counters which are used.

Mr. Charles F. Pidgin, Chief Clerk of the Massachusetts Bureau, addressed the Convention in explanation of the system of tabulation devised by him, and used in connection with the census work of the Massachusetts Bureau.

Mr. Pidgin's tabulating system makes use of both printed devices and machinery. For the tabulation of population and social statistics, statistics of births, deaths, and marriages, and all other tabulations where the tallying or counting is done one at a time, the printed self-counting tally-sheet and the automatic tabulating machine are used. For aggregating statistics of agricultural or similar work, where a great number of small numbers are to be added, the "chip system" is used. For aggregating statistics of manufactures, the fisheries, commerce, wealth, debt, taxation, or any work in which large numbers are to be added, the printed "valuation, quantity, and number" sheet, and several adding machines, including the electrical adding machine, are made available.

The noon recess was then taken.

In the afternoon, the Secretary, in the absence of the author, read a paper by Mrs. Florence Kelly Wischnewetzky, of Philadelphia, on the employment of children and the collection of statistics relating thereto. The paper advanced the theory that child labor was increas-

ing, and criticised the data on the subject collected by different authorities, in that they were incomplete, and not "statistically finished." Investigations should be consecutive for periods of years, and the tables should be accompanied by proper analysis to bring out the salient points. The author did not agree with Commissioner Wright, who had expressed the opinion that child labor was decreasing, and lamented the fact, as stated by her, that neither herself nor Mr. Wright was able to prove their theories by statistical evidence. The paper especially criticised the report of the Rhode Island census, as being incomplete.

Mr. Bowditch, of Rhode Island, in the discussion that followed, expressed the opinion that the author of the paper had not thoroughly read the Rhode Island report.

Mr. Wadlin, of Massachusetts, while agreeing that investigations should be consecutive, so as to allow comparisons from period to period, thought that the criticism expressed by the author, that the reports of the different bureaus on the subject were not always accompanied by sufficient analysis to point out the conclusions to be drawn from them was hardly fair. The insufficient appropriation at command of many of the Bureaus would not permit other than the presentation of the basis of analyses, leaving deductions to be made by the public. In the Massachusetts reports analysis always accompanied the tabular matter so far as possible. The question of child labor was, after all, beyond the scope of most bureaus to deal with, except in a local and fragmentary way. The inquiries regarding it were really census inquiries, and to be conclusive should depend on an enumeration or canvass covering all employments throughout the country, undertaken at stated times. Such inquiries through the Massachusetts Census showed absolutely that child labor had largely decreased in that state between 1875 and 1885. These facts seemed to have been overlooked by the author, although in the census report just issued they had been clearly pointed out and accompanied by complete analysis. They, at least, tended to confirm the theory advanced by Col. Wright, and were at variance with that of Mrs. Wischnewetzky.

Mr. Keene, of New York, referred to factory inspection in New York, which had to do with child labor, and to the failure of a bill to add several women inspectors. Answering inquiries by Mr. Meriwether, of Missouri, regarding the course pursued when parents

swore that working children were of lawful age, Mr. Stark, of Wisconsin, explained that the Bureau ordered discharge when convinced that children were under the legal age. Commissioner Wright explained the position taken by the Massachusetts factory inspectors, showing that great pains were taken to ascertain any violation of the law as to child labor, and in a most effective style confronted with statistics the declarations of Mrs. Wischnewetzky that child labor was increasing. He showed, also, the deceptiveness of comparing complete statistics of one date with incomplete statistics of other dates. Mr. Hotchkiss, of Connecticut, explained that the school board, under the law of that state, had control regarding child labor, and testified as to the thoroughness of inspection.

Mr. Blue, Assistant Minister of Agriculture of Ontario, was invited to address the Convention, and explained the method of his department in collecting labor statistics. He spoke warmly of the good work the Bureaus were doing. Mr. W. M. Grosvenor, of *The New York Tribune*, was invited to address the Convention, and spoke of the importance of unifying the work in the various states by collecting similar data for comparison, suggesting the collection of statistics of wages and prices upon a uniform basis in the different states. Prof. Bemis, of Vanderbilt University, on invitation, spoke especially of the need of better statistics regarding rents. Mrs. Lita Barney Sayles, General Secretary of the Sociologic Society of America, upon invitation briefly responded regarding the harmony of statistical and sociological labors.

The Convention then listened to an eloquent address by the Rev. Dr. Strong, of New York, on the work of the Evangelical Alliance. He knew that nothing was so hard as to catch and cage a fact, and, with Josh Billings, would rather know less than to know so much that is not so. His labors had been an endeavor to ascertain man's actual relations with man. The Church had dwelt upon man's relations to God as if forgetting the commandment to love a fellow man as one's self. In the application of this law lay the only remedy for the evils which statistics of labor disclosed. The Rev. J. H. Jones, of Massachusetts, spoke strongly for labor reform, eight hours' work, free transportation to and from homes, and the practical abolition of cities. Prof. Graham Taylor, of Hartford Theological Seminary, deeply interested the Convention in an eloquent address regarding the relations of religion in the solution of social problems. The

Hon. T. S. Coe, the veteran chairman of the Connecticut State Board of Agriculture, closed the session with a warm recognition of the usefulness and the high spirit of the labors of the Bureaus.

On Thursday, by special invitation, the Convention visited the Cheney Silk Works, at South Manchester; the mills of the Willimantic Linen Company, at Woonsocket; and the Ponemah Cotton Mills, at Taftville.

Before adjournment, which was reached on Thursday evening, a committee was appointed to consider the feasibility of a plan for undertaking some special line of statistical work upon a common basis by the different Bureaus.

Among those present at the sessions of the Convention were the following: Archibald Blue, Assistant Minister of Agriculture and Secretary of the Bureau of Industries for Ontario, Toronto; Edward W. Bemis, Professor of Economics and History, Vanderbilt University, Nashville, Tenn.; Frank A. Flower, ex-Commissioner, Wisconsin; the Rev. Jesse H. Jones, editor of *The Public*, North Abington, Mass.; James H. Brinton, Special Agent Department of Labor, Washington, D. C.; Charles F. Pidgin, Chief Clerk, Massachusetts Bureau; John H. Davis, Chief Clerk of Rhode Island Bureau; H. Hollerith, Engineer, 617 Sewell Street, Washington, D. C.; the Rev. Graham Taylor, D. D., Professor of Practical Theology, Hartford Theological Seminary; George H. Wood, Superintendent of Typograph Company, Hartford, Conn.; William C. Hunt, Special Agent of the Eleventh Census of the United States; George K. Holmes, Great Barrington, Mass., Statistician; the Rev. Josiah Strong, General Secretary Evangelical Alliance, New York; S. N. D. North, Boston, Mass., Secretary National Association of Wool Manufacturers, Special Agent Eleventh Census for Wool Manufactures; Miss Annie L. Sargent, of the Organized Charities, New York City.

BOOKS RECEIVED BY THE LIBRARY.

HEALTH REPORTS. — STATE.

California. Tenth Biennial Report of State Board of Health, from June 30, 1886, to June 30, 1888. Pp. 288.

Connecticut. Eleventh Annual Report of the State Board of Health, for year ending Nov. 30, 1888, with Registration Report for 1887. Pp. xiv, 360, 200.

Illinois. Ninth Annual Report of the State Board of Health, for 1886, with an Appendix, embracing Reports on State Sanitary Survey, Vital Statistics, Meteorological Tables, and State Medicine, in 1886. Pp. xiii, lxviii, 274.

Indiana. Fifth Annual Report of the State Board of Health, for year ending Oct. 31, 1886. Pp. 293, 82, viii.

Sixth, for year ending Oct. 31, 1887. Pp. 342.

Iowa. First Biennial Report of the State Board of Health, for period ending June 30, 1881. Pp. xiv, 346.

Second, for period ending June 30, 1883. Pp. 417.

Third, " " " 1885. " 584.

Fourth, " " " 1887. " xiii, 183.

Monthly Bulletins; editor, J. F. Kennedy, M. D. Current numbers for 1888, 1889.

Kansas. First Annual Report of State Board of Health, from April 10, 1885, ending Dec. 31, 1885. Pp. 183.

Second, for 1886. Pp. 236.

Third, " 1887. " 385.

Fourth, " 1888. " xiv, 345.

Maine. First Annual Report of the State Board of Health, for 1885. Pp. 381.

Second, for 1886. Pp. x, 295.

Third, " 1887. " xii, 324.

Maryland. Second Biennial Report of the State Board of Health, Jan., 1878. Pp. xi, 150.

Third, Jan., 1880. Pp. 115.

Fifth, " 1884. " 275.

Sixth, " 1886. " 233.

Seventh, " 1888. " xii, 658.

Massachusetts. Nineteenth Annual Report of the State Board of Health, for year ending Sept. 30, 1887. Pp. lvii, 375.

Michigan. Fifteenth Annual Report of the State Board of Health, for year ending June 30, 1887. Pp. l, 232.

New Hampshire. Third Annual Report of the State Board of Health, for year ending April 30, 1884. Pp. 335.
Fourth, for year ending April 30, 1885. Pp. 317.
Fifth, " " " 1886. " 326.
Sixth, " " " 1887. " 302.
Seventh, " " " 1888. " 326.

New Jersey. Twelfth Annual Report of the Board of Health and Report of the Bureau of Vital Statistics, for 1888. Pp. 503.

New York. Seventh Annual Report of the State Board of Health, Jan. 19, 1887. Pp. 639.
Eighth, Feb. 27, 1888. Pp. 348.
Monthly Bulletins of Deaths and their Causes, for current months of 1888 and 1889.

Ohio. First Annual Report of the State Board of Health, for year ending Oct. 31, 1886. Pp. 256.
Second, for year ending Oct. 31, 1887. Pp. 374, 34.

Pennsylvania. Second Annual Report of the State Board of Health and Vital Statistics, for year ending Oct. 31, 1886. Pp. 1056.
Third, for year ending Dec. 31, 1887. Pp. 338.

Rhode Island. Eighth Annual Report of the State Board of Health, for 1885, and Report upon Births, Marriages, and Deaths in 1884. Pp. 182, ix, 173.
Ninth, for 1886, and Report upon Births, etc., in 1885. Pp. 164, viii, 198.
Tenth, for 1887, and Report upon Births, etc., in 1886. Pp. 146, viii, 192.

West Virginia. Third Annual Report of the State Board of Health, for 1883. Pp. 74.

District of Columbia. Report of Health Officer, for year ending June 30, 1886. Pp. 186.
For year ending June 30, 1887. Pp. 168.
" " " 1888. " 181.

MUNICIPAL.

Baltimore, Md. Annual Report of the Health Department of Baltimore, for 1880. Pp. 128.

For 1882.	Pp. 108.	For 1886.	Pp. 329.
" 1883.	" 151.	" 1887.	" 291.
" 1884.	" 196.	" 1888.	" 273.

Weekly Mortality Reports, 1878 to 1888. 6 vols.
Mortality Charts: No. 1, Annual mortality from cholera infantum and of children under five years of age, from 1830 to 1888; No. 2, from zymotic diseases and all causes, from 1836 to 1888; No. 3, from small-pox and scarlet fever, from 1830 to 1888; No. 4, from diphtheria, phthisis, pulmonalis, and pneumonia, from 1860 to 1888.

Boston, Mass. Sixteenth Annual Report of the Board of Health, for 1887. Pp. 81.
For 1888. Pp. 86.

Chicago, Ill. Report of Department of Health, for 1878. Pp. 55.
For 1881–82. Pp. 177.
" 1883–84. " 172.
" 1885. " 123.
For 1886. Pp. 100.
" 1887. " 119.

Cleveland, O. Twelfth Annual Report of the Health Department, for 1884. Pp. 24.
Fifteenth, 1887. Pp. 38.
Sixteenth, 1888. " 41.

Hartford, Conn. First Annual Report of the Board of Health, March, 1886. Pp. 22.
Second, for year ending Feb. 29, 1887. Pp. 24.
Third, " " " 1888. " 31.
Fourth, " " " 1889. " 32.

Keokuk, Iowa. Report of the Board of Health, for year ending March 31, 1887. Pp. 25
For year ending March 31, 1888. Pp. 29.
Monthly Reports of the Office of the Board of Health on Vital Statistics, for April and May, 1889.

Lowell, Mass. Annual Reports of the Board of Health and of Vital Statistics, for 1878. Pp. 13, 12.
For 1879. Pp. 6, 9.
" 1880. " 8, 6, 12.
" 1881. " 9, 9, 13.
" 1882. " 50.
For 1883. Pp. 9.
" 1884. " 19.
" 1885. " 10, 7.
" 1886. " 13.
Report of the Board of Health, City Physician, Superintendent of Burials, Marriages, and Deaths, for 1887. Pp. 26, 23, 7.

Madison, Wis. Report of the Board of Health, for 1885. Pp. 9.
Report of the Health Officer, for year ending March, 1888. Pp. 32.
For year ending March, 1889. Pp. 29.

Minneapolis, Minn. Annual Report of the Board of Health, for year ending March 31, 1888. Pp. 96.
For year ending March 31, 1889. Pp. 52.

Nashville, Tenn. Condensed Statement of the Mortality in the City of Nashville, for 1879 to 1884, inclusive. Published by the Health Officer and Registrar. Pp. 44.
For year ending Dec. 30, 1885. Pp. 6.
" " Sept. 30, 1886. " 6.
" " " 1887. " 6.
" " " 1888. " 6.

Newark, N. J. Second Annual Report of the Board of Health, for 1886. Pp. 61.
Third, for 1887. Pp. 53.

Pittsburgh, Pa. Annual Report of the Board of Health, for 1873. Pp. 95.

For 1875. Pp. 106.
" 1876. " 123.
For 1877. Pp. 70.
" 1879. " 100.

Public Health Reports, for the years 1881–86. Pp. 47.

Somerville, Mass. Second Annual Report of the Board of Health, for 1879. Pp. 59.

Third, for 1880. Pp. 26.
Fourth, " 1881. " 37.
Sixth, " 1883. " 28.
Seventh, " 1884. " 23.
Eighth, for 1885. Pp. 23.
Ninth, " 1886. " 21.
Tenth, " 1887. " 27.

St. Louis, Mo. Fifth Annual Report of the Health Commissioner, for year ending April 10, 1882. Pp. 115.

Annual Report of the Health Department, for year ending April 9, 1883. Pp. 96.

Seventh Annual Report of Health Commissioner, for year ending April 7, 1884. Pp. 317–416.

For year ending April 13, 1885. Pp. 97.

Tenth, for year ending April 11, 1887. Pp. 141.

Eleventh, " " " 9, 1888. " 115.

REGISTRATION REPORTS.

Iowa. First Registration Report of the State Board of Health, for year ending Oct. 31, 1881. Pp. 811.

Massachusetts. Forty-sixth Report relating to the Registry and Returns of Births, Marriages, and Deaths, for 1887, with Reports of Libels for Divorce and Returns of Deaths investigated by Medical Examiners, for 1887. With Editorial Remarks by Samuel W. Abbott, M.D. Pp. x, 440.

Michigan. Twentieth Annual Report of Births, Marriages, and Deaths, for 1886, by the Secretary of State. Pp. viii, 255.

New Hampshire. Fourth Annual Report of Births, Marriages, Divorces, and Deaths, for 1883. Vol. I. New Series. Pp. 57.

Fifth, for 1884. Vol. II. New Series. Pp. 141.
Sixth, " 1885. " III. " " 163.
Seventh, " 1886. " IV. " " 249.
Eighth, " 1887. " V. " " 248.

Rhode Island. Thirty-fifth Report upon Births, Marriages, and Deaths, for 1887. Prepared by Charles H. Fisher, M.D. Pp. iv, 193.

EDUCATION. — COLLEGE CATALOGUES.

Amherst. General Catalogue, 1821–85. Pp. 103.
Catalogue, 1888–89. Pp. 59.

Brown. Annual Report of President to Corporation, June 21, 1888. Providence. Pp. 39.

Catalogus Senatus Academici, et eorum qui munera et officia gesserunt, quique honoribus academicis donati sunt, in Universitate Brunensi, quae est Providentiae in republica Insulae Rhodiensis. 1886. Pp. xxiv, 134.

Bryn Mawr. President's Report to the Board of Trustees, 1887–88. Pp. 30.

Program, 1888. Pp. 51.

California, University of. Biennial Report of the President to the Governor of the State. Berkeley. Pp. 120.

Register, 1887–88. Pp. 158.

Cornell. The Ten-Year Book. II. 1868–88. Ithaca. Pp. 215.

Register, 1888–89. 2nd edition. Pp. 234.

Annual Report of President, 1887–88. Pp. 158.

Columbia. Annual Register, 1888–89. New York. Pp. 98.

Report of President, 1887–88. Pp. 153.

Handbook of Information, 1888–89. Pp. xviii, 301.

Catalogue of Officers and Graduates, 1754–1888. Pp. 361.

Harvard. Annual Reports of the President and Treasurer, 1887–88. Cambridge. Pp. 175, 58.

Catalogus Senatus Academici Collegi Harvardiani, et eorum qui muneribus et officiis praefuerunt, quique honoribus academicis donati sunt, in Universitate quae est Cantabrigiae in civitate Massachusettensium. 1885. Pp. xlii, 143, 121, 78.

Indiana, University of. Fifty-eighth Annual Catalogue, 1887–88. Bloomington. Pp. 94.

Institute of Technology. President's Report, Dec. 12, 1888. Boston. Pp. 50.

Johns Hopkins. Thirteenth Annual Report of President, 1888. Baltimore. Pp. 106.

Register for 1887–88. Pp. 128.

Michigan, University of. Calendar for 1889. Ann Arbor. Pp. 224.

President's Report for year ending Sept. 30, 1888. Pp. 38.

Northwestern University. Catalogue for 1888–89. Evanston. Pp. 178.

Syllabus published for the Students, by the Fraternities of the College of Liberal Arts. Pp. 154.

Ohio State University. Eleventh Annual Report of Board of Trustees, to the Governor, for 1888. Columbus. Pp. 67.

Pennsylvania, University of. Catalogue and Announcements, for 1888–89. Philadelphia. Pp. 208.

New Jersey, College of. Catalogue of the 142nd Year, 1888–89. Princeton. Pp. 176.

Catalogus eorum qui munera et officia gesserunt quique alicujus gradus laurea donati sunt, in Collegio Neo-Caesariensi Princetoniæ, in republica Neo-Caesariensi. 1886. Pp. 238.

Purdue University. Annual Register, 1887–88. Lafayette, Ind. Pp. 79.

For 1888–89. Pp. 103.

Fourteenth Report for two years ending June 30, 1888, to the Governor. Pp. 26.

Tulane University. Catalogue for 1888. New Orleans. Pp. 130.

Vassar. Twenty-fourth Annual Catalogue, for 1888–89. Poughkeepsie, N. Y. Pp. 151.

Wellesley. Calendar, 1888. Pp. 80.

Williams. Catalogue, for 1888–89. Williamstown. Pp. 50.

Report of Franklin Carter, President, of the Seventh Year of his Administration, 1888. Pp. 36.

Yale. Report of President, for year ending July 1, 1887. New Haven. Pp. 60.

Report of President, 1887–88. Pp. 78.

Catalogus Senatus Academici et eorum qui munera et officia academica gesserunt, quique aliquovis gradu exornati fuerunt, in Collegio Yalensi, in Novo-Portu, in republica Connecticutensi. 1886. Pp. xviii, 168, lxxx.

AGRICULTURAL REPORTS.

Michigan. Seventh Annual Report of the Secretary of State, relating to Farms and Farm Products. 1884–85. Pp. xxxiii, 199.

Eighth, for 1885–86. Pp. xxxv, 225.

Ninth, " 1886–87. " xxxi, 144.

Monthly Crop Reports, 1886–87, in numbers, bound vol.; for 1889, Jan. to June, unbound.

Twenty-sixth Annual Report of the State Board of Agriculture, from Oct. 1, 1886, to June 30, 1887. Pp. 566.

Seventeenth Annual Report of the Secretary of the State Horticultural Society, for 1887. Pp. xiii, 587.

RAILROAD REPORTS.

Connecticut. Twenty-second Annual Report of the Railroad Commissioners, for 1874. Pp. 270.

Twenty-fourth, for 1876. Pp. 428.

Twenty-sixth, " 1878. " 332.

Twenty-seventh, " 1879. " 179, 145, 72.

Twenty-eighth, " 1880. " 129, 156, 71.

Twenty-ninth, " 1881. " 101, 145, 65.

Thirty-first, " 1883. " 285, lxxv.

Thirty-third, for 1885. Pp. 292, lxxvii.
Thirty-fourth, " 1886. " 291, lxxvii.
Thirty-fifth, " 1887. " 299, 75.

Massachusetts. Nineteenth Annual Report of the Board of Railroad Commissioners, Jan., 1888. Pp. 313.

New York. Annual Report of State Engineer and Surveyor, and of the Tabulation and Deductions from the Reports of the Railroad Corporations, for the year ending Sept. 30, 1859. Pp. vi, 399.
For the year ending Sept. 30, 1864. Pp. vi, 485.
" " " 1865. " vi, 567.
" " " 1866. " vi, 557.
" " " 1867. " x, 703.
Annual Report of Board of Railroad Commissioners, for the year ending Sept. 30, 1883. Pp. 525. Vol. I.
Second, for the year ending Sept. 30, 1884. Vol. I. Pp. xxxiii, 646. Vol. II. Pp. 1210.
Third, for the year ending Sept. 30, 1885. Vol. I. Pp. xliii, 641. Vol. II. Pp. 1666.
Fourth, for the year ending Sept. 30, 1886. Vol. I. Pp. xxiii, 468. Vol. II. Pp. 1072.
Sixth, for the year ending Sept. 30, 1888. Vol. I. Pp. xxxii, 523. Vol. II. Pp. 997.

Publications of the American Statistical Association.

Of the former publications of the American Statistical Association several are now out of print; the following, however, can be supplied upon application.

Collections of the American Statistical Association, Vol. I. (Parts I–III.) By Rev. Joseph B. Felt, LL.D. Boston, 1847. Pp. 596. Price $5.00.

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(This paper was originally printed in the volume of the Transactions of the Eighth International Statistical Congress, in 1872.)

Financial Connection of the Use of Spirits and Wine with the People of Concord, Massachusetts. By Edward Jarvis, M.D. (Read before the Association, Oct. 20, 1882.) Boston, 1883. Price 25 cents.

Boston's Trade and Commerce for Forty Years, 1844 to 1884. By Hamilton Andrews Hill, A.M. Boston, 1884. Pp. 20. Price 25 cents.

Memorial of Edward Jarvis, M.D. By Robert W. Wood, M.D. Boston, 1885. Pp. 24. Price 25 cents.

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